

PCT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

United States Patent and Trademark
Office
(Box PCT)
Crystal Plaza 2
Washington, DC 20231
ÉTATS-UNIS D'AMÉRIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 06 August 1999 (06.08.99)	
International application No. PCT/GB98/03881	Applicant's or agent's file reference TRC/BP5744354
International filing date (day/month/year) 22 December 1998 (22.12.98)	Priority date (day/month/year) 30 December 1997 (30.12.97)
Applicant O'NEIL, Dominic, Desmond, Phelim	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
24 June 1999 (24.06.99)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p>	<p>Authorized officer: H. Zhou</p> <p>Telephone No.: (41-22) 338.83.38</p>
--	--

This Page Blank (uspto)

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



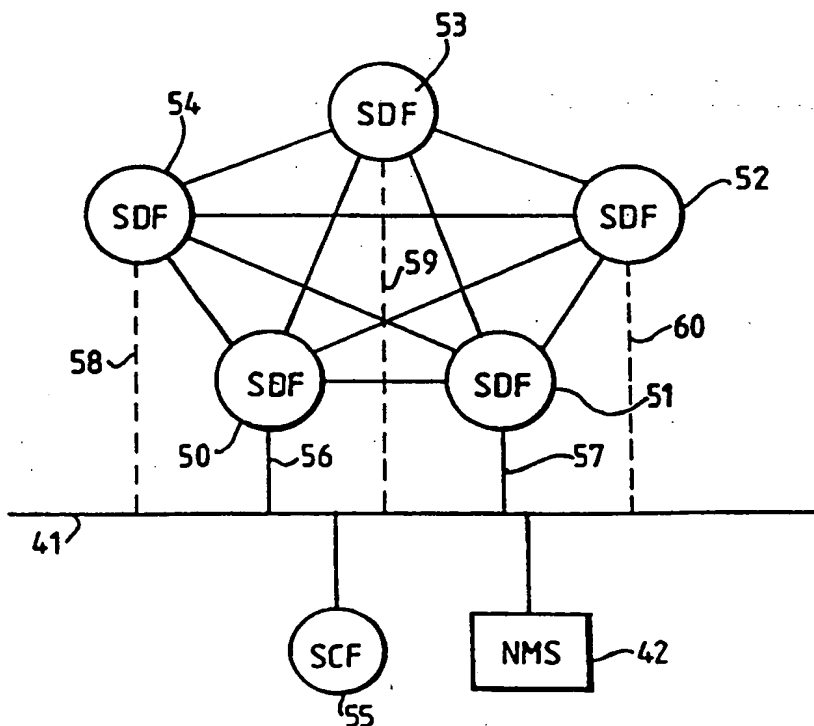
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : H04Q 7/34		A1	(11) International Publication Number: WO 99/35867
			(43) International Publication Date: 15 July 1999 (15.07.99)
(21) International Application Number: PCT/GB98/03881 (22) International Filing Date: 22 December 1998 (22.12.98) (30) Priority Data: 9727463.3 30 December 1997 (30.12.97) GB (71) Applicant (for all designated States except US): ORANGE PERSONAL COMMUNICATIONS SERVICES LIMITED [GB/GB]; St. James Court, Great Park Road, Almondsbury, Bradley Stoke BS32 4QJ (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): O'NEIL, Dominic, Desmond, Phelim [GB/GB]; 13 Berkeley House, Charlotte Street, Bristol BS1 5PY (GB). (74) Agents: CALDERBANK, T., Roger et al.; Mewburn Ellis, York House, 23 Kingsway, London WC2B 6HP (GB).			(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published With international search report.

(54) Title: DATABASE UPDATING IN A MOBILE COMMUNICATION SYSTEM

(57) Abstract

In a telecommunications system a data function and a data control function are replicated in a plurality of databases (50, 51, 52, 53, 54). In order to synchronise updating of the databases (50, 51, 52, 53, 54), one database is identified as a primary database (50), at least one is identified as a primary standby database (51), and the others identified as secondary databases (52, 53, 54). Then, in normal operation, the data control function of the primary database (50) is arranged to generate signals for synchronised updating of the other databases. In the event of a failure of the primary database, the or a standby primary database (51) takes over the upgrading operating. The present invention is particularly, but not exclusively, directed to a telecommunications system for mobile telephones.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakstan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

INTERNATIONAL SEARCH REPORT

In. tional Application No
PCT/GB-98/03881

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q7/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 97 14237 A (ERICSSON TELEFON AB L M ;HOEGBERG LENA (SE); JENSEN LARS (SE); BJO) 17 April 1997 see page 2, line 25 - page 4, line 12 see page 7, line 3 - line 26 see page 8, line 17 - line 35 see page 9, line 19 - page 10, line 8 see page 12, line 24 - page 13, line 8 see page 16, line 29 - page 17, line 26 ---	1,4,5,8
A	US 5 594 942 A (ANTIC NENAD ET AL) 14 January 1997 see column 3, line 12 - column 5, line 29 see column 7, line 25 - line 35 --- -/--	1,4,5,8

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

15 April 1999

Date of mailing of the international search report

26/04/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Gerling, J.C.J.

Fig.2.

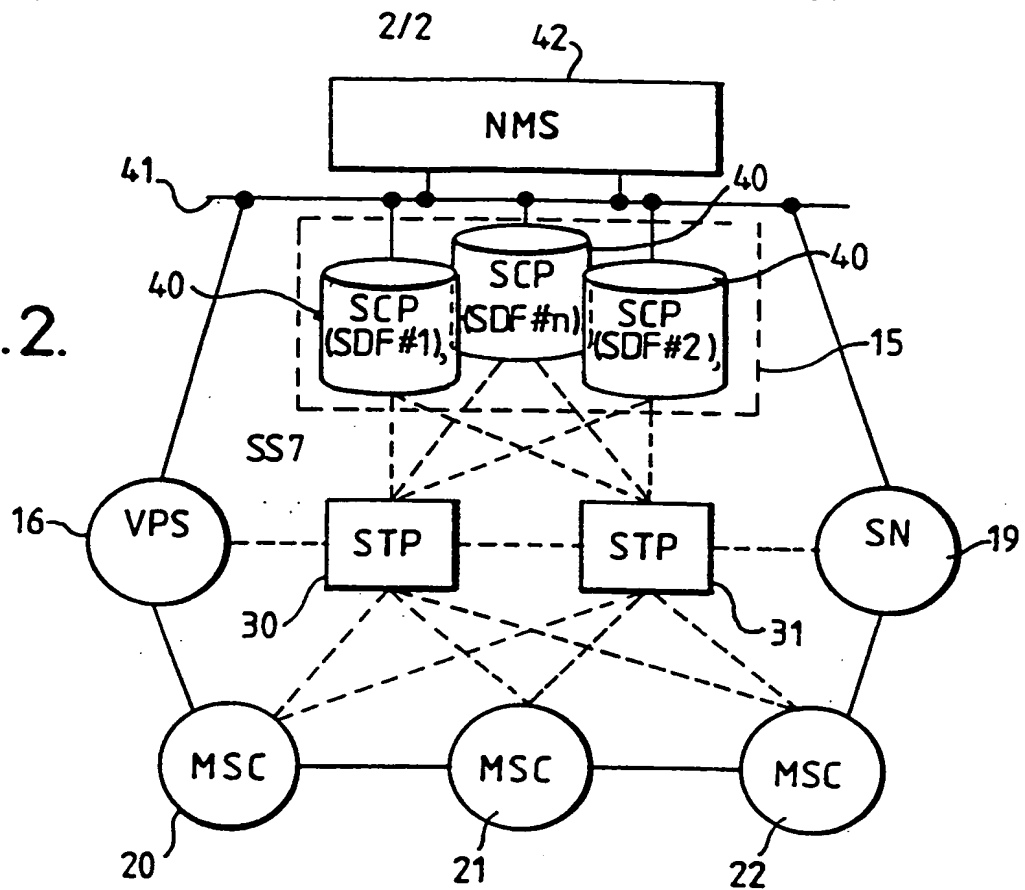
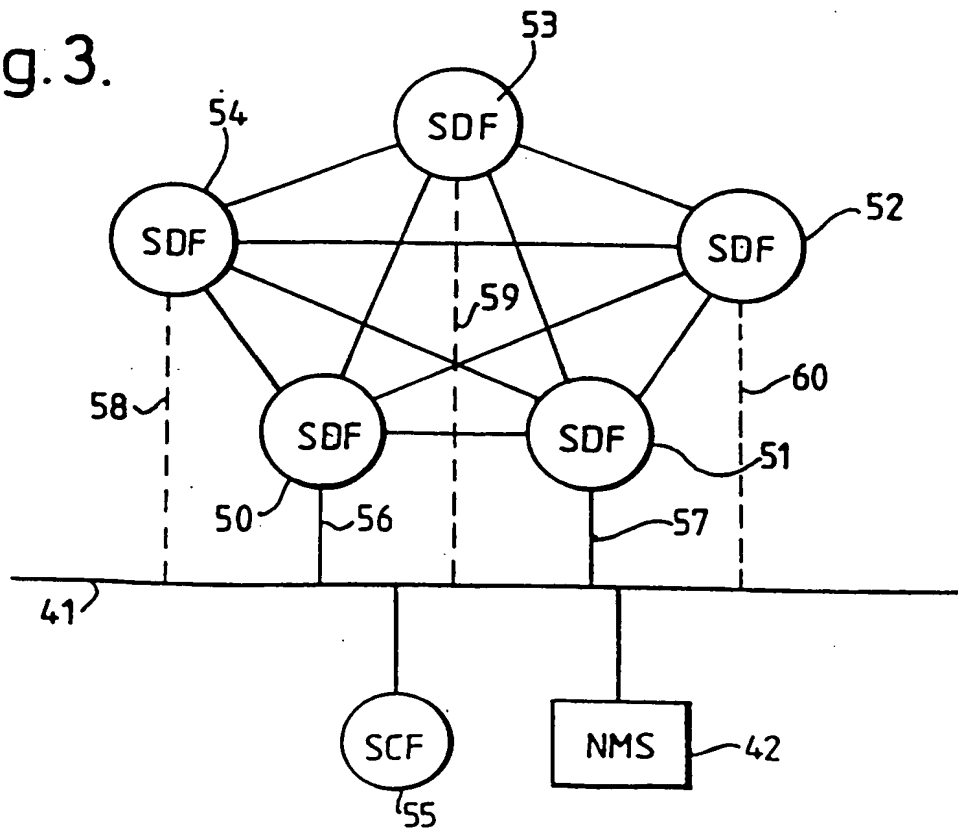


Fig.3.



1/2

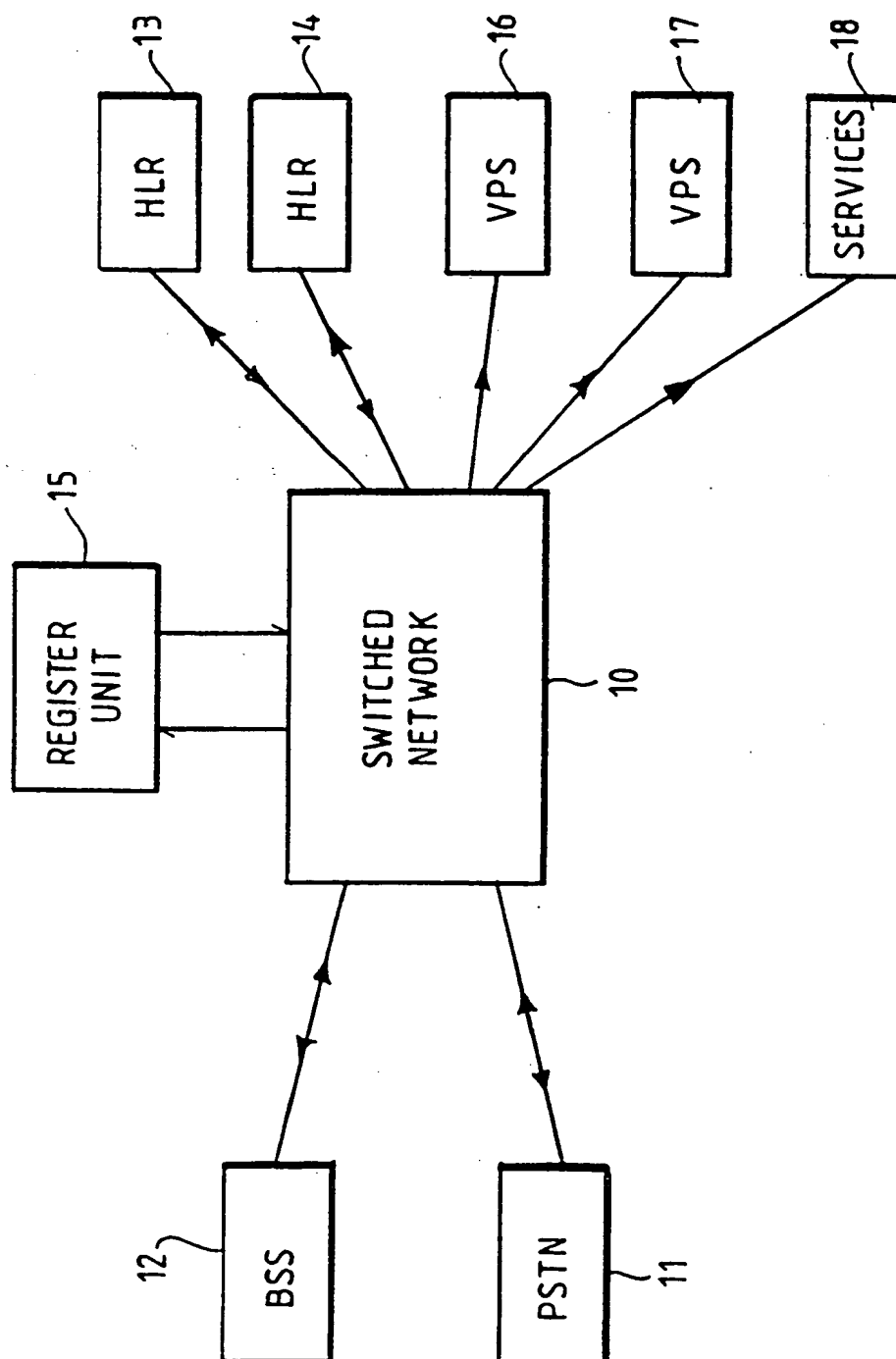


Fig.1.

primary database;

designating at least one other of the replicated
databases as a primary standby database;

updating all of the replicated database on the basis
5 of updating signals received from the primary database
unless the primary database has failed; and

updating all of the replicated databases on the
basis of updating signals from the at least one primary
standby database when the primary database has failed.

WO 99/35867

PCT/GB98/03881

DATABASE UPDATING IN A MOBILE COMMUNICATION SYSTEM
BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

The present invention relates to a telecommunication
5 system. The present invention is particularly, but not
exclusively, concerned with a telecommunications system
for mobile telephones.

SUMMARY OF THE PRIOR ART

When a telecommunication system involves mobile
10 telephones, a call to a mobile telephone is not to a
fixed point, and therefore the system must determine the
location of the destination. The simplest arrangement is
for a call to a mobile telephone to result in a signal
being transmitted to a data storage unit in the form of a
15 Home Location Register unit (HLR) which determines the
location of the mobile telephone, and so permits routing
of the call to occur.

Inevitably, HLRs have a limited capacity, and some
arrangement is therefore necessary to enable
20 telecommunication systems to access multiple HLRs. It
should be noted that it is also envisaged that users may
need multiple MSISDN numbers, for example if a user is to
have the possibility of both voice and data
communication, in existing systems, any second MSISDN

number with a common identity number (IMSI) must be a MSISDN number of the same HLR as the previous MSISDN number. This could be impossible to achieve if, for example, the HLR containing the original information is full. Then the only way that additional services could be provided would require the user to change telephone number, which would be undesirable. This becomes a particular problem if it is desirable that users are able to select their numbers, rather than be provided with them.

WO 96/11557 (corresponding to US 08/809767) the disclosure of which is herein incorporated by reference, proposed that the switch network which connects users to other users, HLRs, and system services, had a register unit associated therewith, which register unit contained information relating each telephone number to a corresponding one of a plurality of HLRs. The relationship between telephone numbers and HLRs should then be freely selectable within the register unit, so that the register unit acted as a converter between the number and the information identifying the HLR.

By providing such a register unit, the fixed relationship between numbers and HLRs was broken, and any

number can be assigned to any HLR, assuming space permits. WO 96/11557 also proposed that the register unit stored further information associated with the mobile telephones which permits the switch network to
5 enable calls from mobile telephones to be routed to different services, depending on the calling mobile telephone itself, in addition to the number dialled.

SUMMARY OF THE INVENTION

The present invention develops further the ideas
10 proposed in WO 96/11557 by considering the location within which information is stored in the network. In WO 96/11557, the question of the location of the register unit was not considered.

When considering data in the network, there are two
15 things that need to be taken into account. The first is the storage of the data itself, and the second is data control, being the means of handling queries, updates, results in synchronisation messages and similar controls. The arrangement described in WO 96/11557 can be
20 considered to be of this type in that the register needs to store data, and also needs to store control information for acting on that data.

At first sight, both the data and the data control

functions may be located at a single site, and stored on a single physical device such as a server which responds to queries and updates. The information stored may be considered to comprise a data function and a data control
5 function, with the data function representing sets of data relating to respective telephone numbers, telephone control operations, etc. The data function and data control function may be considered to form a database of functions.

10 However, if there is only a single database that operate in this way, the network is vulnerable to failure. Therefore, at its most general, the present invention proposes that the database of functions be replicated a plurality of times. Each database comprises
15 a data function and a data control function. The replicated databases may physically be located in a single location, or may be at a plurality of physically separate locations. In either case, each replicated database may be considered to be a service data function
20 with each such function being a notional site in the network. The sites of the functions are thus virtual sites, rather than being necessarily physically separate.

Preferably, each service data function may be stored

on a separate storage device. That storage device may also store other information needed by the network, or may control only the service data function. However, from an operational point of view, the relationships
5 between the service data functions are more important than their physical locations. Although the service data functions represent a distributed database, that distributed database must form a logically singular entity, even when physically distributed. Otherwise, the
10 network will not operate correctly. Therefore, control must be applied across the distributed database.

For example, when considering such a distributed set of functions, it is important for the data functions to be synchronised and the data control functions to
15 interwork to control the synchronisation. This synchronisation includes not only the need for the information about any particular telephone number to be the same at each function, but also for the facilities associated with that telephone number to be the same at each
20 function. The present invention therefore relates to the synchronisation of those functions.

It should be noted that although the present invention has been developed in connection with the

register unit of WO 96/11557, the present invention is not limited to the operation of that register unit; and relates to arrangements in any network in which functions are distributed. Where the present invention is used in
5 connection with the register unit of WO 96/11557, the register unit may be embodied in any of the distributed service data functions, or the actions of the register unit may be distributed across more than one service data function.

10 In a telephone network, it is important that any updating of the functions is carried out in real-time, and in a synchronised way. It is not acceptable for the network to be updated gradually, as happens in existing computer database techniques.

15 The present invention therefore proposes that, in a network of interconnected functions each of which is to be synchronised, one of those functions is identified as a primary function, at least one other function is identified as a primary standby function, with any
20 remaining function(s) being considered secondary. Then, when updating is needed, the primary function synchronises all other functions by signalling to them an update that it has received. Those other functions then

signal to the primary function that they have acted on the update. The primary function may then signal externally that the update has occurred, and at the same time provide acknowledgement signals to the other
5 functions.

In principle, only the primary function can do this. However, if for any reason the primary function fails, the primary standby function takes over control of the updating operation.

10 There may be multiple primary standby functions, although in a mobile telephone system other constraints may limit arrangements to a single primary standby function. All other functions are secondary, in the sense that they are incapable of taking over control of
15 the updating operation without re-programming of the network.

In such a system, requests for updating are sent only to the primary function, unless that has failed, in which case all update requests are sent to the primary
20 standby function.

In such an arrangement, it is possible for a secondary function to fail to carry out an update correctly. In such circumstances, the primary function

is aware of this because it does not receive an appropriate acknowledgement, and the secondary function is then treated as unsynchronised. In the unsynchronised state, the primary function will not attempt to update
5 the secondary function. There may, however, be arrangements to permit an unsynchronised secondary function to resume a synchronised state, by causing the primary function to transmit to that secondary function all updates which have occurred since the secondary
10 function became unsynchronised. Therefore, it is preferable that the primary, the primary standby, and/or the secondary function is arranged to record when any secondary function becomes unsynchronised.

BRIEF DESCRIPTION OF THE DRAWINGS

15 An embodiment of the present invention will now be described in detail, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a schematic block diagram of a telecommunication system described in WO 96/11557.

20 Fig. 2 shows part of the telecommunication system of the present invention; and

Fig. 3 shows part of the arrangement of Fig. 2, in terms of significant functional components.

DETAILED DESCRIPTION

Referring first to Fig. 1, and as discussed in WO 96/11557, a switched network 10 interconnects land-based and mobile telephones. If a call to a mobile telephone is made from a land-based telephone, the call is routed via the public switched telephone network (PSTN) 11 to the switch network, and from that switch network 10 to the mobile telephone (BSS) 12. To do this, the switch network 10 must determine routing information, and to determine that routing information it must determine the location of the mobile telephone 12, which it does via a HLR to which the mobile telephone 12 is associated. When there are multiple HLRs 13,14, it is necessary for the switch network 10 to determine which HLR 13,14 must be accessed, on the basis of the telephone number (MSISDN number) of the mobile telephone input by the originator of the call.

The switched network 10 accesses a register unit 15, which identifies the called number and addresses it to a particular HLR 13,14 with which the mobile telephone 12 is associated. The register unit 15 permits the relationship between any given mobile telephone number and the HLRs 13,14 to be determined freely, so that the

number is unaffected by the particular HLR 13,14 with which it is associated. The register unit 15 removes the need for a particular mobile telephone number to be associated with a fixed HLR 13,14.

5 Once the particular HLR 13,14 with which the mobile telephone 12 is associated has been identified, signalling can occur to that HLR, and information derivable therefrom, in the usual way. This information is used to "set-up" the call to the mobile telephone 12,
10 which may then be routed to the destination telephone as is normal.

 Similarly, if a call originates at the mobile telephone 12, the switch network 10 must again determine the routing of that call. If the call is to a land-based
15 telephone, connected to the switch network 10 via the PSTN 11, then this routing can be on the basis of the telephone number of the destination telephone, in the normal way.

 If a call is made from a mobile telephone 12 to one
20 of a plurality of voice processing systems 16,17 or to services 18 associated with the switch network using a short code (e.g. 123) the relationship between the mobile telephone 12 and the corresponding service must be

determined by the register unit 15 before the switch network can determine the appropriate voice processing system 16,17 or services 18 to be accessed.

Fig. 2 shows the switch network 10 in more detail.

5 It has a plurality of mobile switching centres (MSC) 20,21 and 22, and a call destined to any given mobile telephone results in signalling between that MSC 20-22 and one of a plurality of signalling transfer points (STP) 30,31, which signal to the register unit 15 to
10 determine the HLR 13,14 which is appropriate to the mobile telephone 12. The register unit 15 of Fig. 1 derives that information from the telephone number (MSISDN number) of the mobile telephone 12. It would then be possible for the register unit 15 to forward the
15 signal directly to the appropriate HLR 13,14 but, it is preferable that the information is passed back to the corresponding STP 30,31 which then passes the signalling to the correct HLR 13,14.

A similar signalling flow occurs when the user of
20 the mobile telephone 12 tries to access a voice processing system (VPS) 16 or a service node (SN) 17. The call is received by one of the MSCs 20,21 and 22 which passes the dialled digits and the identity of the

mobile telephone to one of the STPs 30,31,32. This
relays the information to the register unit 15, which
uses this information to construct the correct address of
the appropriate voice processing service (VPS) 16 or
5 service node (SN) 17. That information is relayed back
from the register unit via one of the STPs 30,31,32 to
the original MSC 20,21,22. This address is then used to
route the call by the switch network 10. That routing
passes the call from the appropriate MSC 20,21,22 via the
10 switch network to the VPS 16 or the SN 17.

In the arrangement shown in Fig. 2, the register
unit 15 is not a single component, but comprises a
plurality of units hereinafter referred to as service
control points (SCP) 40. There are N SCP 40, wherein N
15 is an integer being 2 or greater. At least two SCP 40
are needed in order to provide a replicated database for
load sharing and fault tolerance.

In the arrangement of Fig. 2, the SCPs 40 are
interconnected by a data connection 41, and the system
20 also has a controller (NMS) 42 that monitors the service
control points (SCP) 40.

Fig. 2 illustrates the arrangement of the network in
structural terms. However, it is also possible to think

of the arrangement in functional terms, and the significant functions of the arrangement of Fig 2 are illustrated in Fig. 3. The SCPs 40 may, collectively, be considered as a plurality of functions, primarily data
5 functions, which collectively provide a centralised repository for service/subscriber related data. Each of these functions will be referred to as a service data function or SDF. Thus, as shown in Fig. 3, a plurality of such functions (SDFs) 50,51,52,53 and 54 are
10 interconnected, and connected to the data connection 41. Fig. 3 also shows a service control function SCF 55 which is a logical element (in the same way as the SDFs 50-54 are logical elements) corresponding to VPS 16, service node 19 etc. in Fig 2. The SCF 55 can be thought of as a
15 "client" within the network which requests data from, updates to, etc the SDFs 50-54.

One of the SDFs 50 is designated a primary function, and has primary responsibility for synchronising updating of the other SDFs 51-54. The link between the SCF 55 and
20 the data connection 41 is a path for data being retrieved by an SCF 55, and also of update information to the SDF 50.

At least one other SDF 51 is designated a primary

standby function and has a similar link 57 to the connection 41. As will be discussed in more detail later, the primary standby function 51 operates to take over the control of updating carried out by the primary function 50 if the primary function 50 is unable to carry out that operation correctly. Whilst there may be more than one primary standby function, in the arrangement shown in Fig. 3, all the other SDFs 52,53,54 are secondary functions. Those secondary functions 52,53,54 are also connected by suitable connection 58, 59, 60 to the data connection 41. Those connections 58, 59, 60 are involved in retrieval of data for an SCF, synchronisation of updates from the primary function SDFs, but not directly in updating from an SCF. Instead, all the SDFs 50-54 are interconnected for updating controlled by the primary function 50, or the primary standby function 51. In fact, those interconnecting are normally via connections 56 to 60 and data connection 41, but for functional purposes may be considered to be direct as shown in fig. 3.

In normal use, functions (SDFs) 50-54 provide a composite memory in which, in a mobile telephone system, information about users, network functions, etc may be

stored as discussed in more detail in WO 96/11557.

The present invention, however, is particularly concerned with the updating of the function network thus created.

5 In normal operation, a request for updating of data stored in the SDFs 50-54 is received at the primary function 50. When update information is received by the primary function 50, the primary function 50 signals the update to all other functions 51-54. When those
10 functions 51-54 have recorded the update, they signal back to the primary function 50 that the update has been completed. Thus, the primary function 50 can store information confirming that all the other functions 51-54 have been successfully updated. The primary function 50
15 may then signal to the SCF 55 to confirm that the update operation has been completed, and also confirm to the other functions 51-54 that it has recorded the completion of the update and that the SCF has been notified. Thus, at all times, the functions 50-54 are synchronised.

20 If any secondary function 50-54 fails successfully to record an update, this will be detected by the primary function 50 and that secondary function will then be considered unsynchronised, and thus not a reliable source

for data. The primary function 50 will not attempt to send further update signals to such an unsynchronised secondary function. Of course, if there are too many failures, the primary function may determine that the attempted update of the network of functions has wholly failed, in which case a suitable signal will be sent to the SCF 55, and the update operation rejected.

It is preferable that an unsynchronised secondary function can subsequently return itself to the synchronised state. An unsynchronised secondary function may signal to the primary function 50 an indication of the last update which it successfully completed. The primary function 50 may then determine all subsequent updates and transmit all those updates to the unsynchronised secondary function. If the unsynchronised secondary function successfully records all those updates, it may be considered to have returned to synchronisation. Once synchronised, the primary function 50 will continue to update that secondary function in the normal way.

Under some circumstances, the primary function 50 may need to be closed down. For example, this may be because the hardware on which the primary function 50 is

resident needs to be maintained. To prevent the network of functions having to be closed down at this time, the actions of the primary function 50 are transferred to the primary standby function 51. This hand-over of

5 operations is signalled between the primary function 50 and the primary standby function 51, and also with the SCF 55. Any existing updates should be completed before this hand-over occurs, so that all SDFs are synchronised prior to the primary standby function 51 taking over.

10 This procedure can also apply in an unexpected failure of the primary function 50. As has previously been mentioned, when the primary function 50 has received confirmation from all the other functions 51 - 54 that updating had occurred, it notifies the requesting SCF and
15 then signals an acknowledgement to those other functions. If that acknowledgement is not received by the primary standby function 51 within a predetermined time and the primary standby function 51 is informed by the switched network 10 that the primary function is unavailable, the
20 system may be arranged so that the primary standby function 51 then automatically takes over control of the network functions 50-54 under the assumption that the primary function is no longer available.

Simultaneous failure of one or more secondary functions does not prevent the network of functions operating successfully, and either the primary function 50 or the primary standby function 51 may fail, in combination with any of the secondary functions 52-54 and data updating and querying will still be possible. However, if both the primary function 50 and the primary standby function 51 fail at the same time, then the remaining network of functions will only be able to support data retrievals; data updating will not longer be possible. For this reason, it may be preferable to provide multiple primary standby functions, although other constraints within mobile telephone networks may prevent this.

It should be noted that although Fig. 3 illustrates an embodiment with five functions (SDFs) 50-54, the minimum number of functions to achieve the present invention is two. In such an arrangement, one function acts as a primary function, and the other acts as a primary stand-by function. Further secondary functions then increase redundancy and load sharing.

In the above description, each service control point (SCP) 40 was associated with a corresponding SDF 50 to

54. It should be noted that any single SCP 40 may act as the storage site for only the corresponding SDF 50-54, or may store other information, such as data or control operations.

5 Moreover, in the preceding description, the present invention has been described in terms of a way of implementing the arrangements discussed in WO 96/11557. However, the present invention is not limited to this. The operations carried out by the SDF 50-54 may be any
10 data and/or data control functions. The operations described with reference to WO 96/11557 then act as examples of such functions.

CLAIMS

1. A telecommunication network having at least one database of functions for controlling the network, said database comprising at least a data function and a data
5 control function;

characterised in that:

the database is replicated a plurality of times, the database of one of said replicated databases is a primary database, the data control function of which is arranged
10 to generate signals for synchronised updating of all of said replicated databases, and at least a second database is a primary standby database, the data control function of which is arranged to generate signals for synchronised updating of all of said replicated databases in the event
15 of a failure of said primary database.

2. A network according to claim 1, wherein a plurality of databases are primary standby databases.

3. A network according to claim 1 or claim 2, wherein databases other than said primary database and said
20 primary standby database(s) are secondary databases and are arranged to signal to said primary and/or said primary standby database(s) when they have been updated in response to the updating signals from said primary of

said primary standby database(s).

4. A method of operating a telecommunication network,
in which the network is controlled by at least one
database of functions, said database comprising at least
5 a data function and a data control function;

characterised in that:

the database is replicated a plurality of times, and
the method comprises:

- designating one of said replicated databases as a
10 primary database;

designating at least one other of said replicated
databases as a primary standby database;

- updating all of said replicated databases on the
basis of updating signals from said primary database
15 unless said primary database has failed; and

updating all of said replicated databases on the
basis of updating signals from said at least one primary
standby database when said primary database has failed.

5. A telecommunications network comprising:
20 a primary database having at least a data function
and a data control function; and

a plurality of secondary databases which are
replicas of the primary database, wherein at least one of

the secondary databases in a primary standby database;

wherein the data control function of the primary database is arranged to generate signals for synchronised updating the secondary databases, and wherein the data

5 control function of the primary standby database is arranged to generate signals for synchronised updating of all of the secondary databases in the even of a failure of the primary database.

6. A network according to claim 5, further comprising a
10 plurality of primary standby databases.

7. A network according to claim 5, wherein the secondary databases other than the primary database are arranged to signal to the primary and/or the primary standby database(s) when they have been updated in
15 response to the updating signals from the primary database.

8. A method of operating a telecommunication network, comprising:

providing an initial database having at least a data
20 function and a data control function;

replicating the initial database to form plurality of replicated databases;

designating one of the replicated databases as a

09/582721

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference TRC/BP5744354	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 98/ 03881	International filing date (day/month/year) 22/12/1998	(Earliest) Priority Date (day/month/year) 30/12/1997
Applicant ORANGE PERSONAL COMMUNICATIONS SERVICES.. et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

4. With regard to the **title**,

☐ the text is approved as submitted by the applicant.

☒ the text has been established by this Authority to read as follows:

DATABASE UPDATING IN A MOBILE COMMUNICATION SYSTEM

5. With regard to the **abstract**,

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

3

☐ None of the figures.

This Page Blank (uspto)

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/03881

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q7/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 97 14237 A (ERICSSON TELEFON AB L M ;HOEGBERG LENA (SE); JENSEN LARS (SE); BJO) 17 April 1997 see page 2, line 25 - page 4, line 12 see page 7, line 3 - line 26 see page 8, line 17 - line 35 see page 9, line 19 - page 10, line 8 see page 12, line 24 - page 13, line 8 see page 16, line 29 - page 17, line 26 ---	1,4,5,8
A	US 5 594 942 A (ANTIC NENAD ET AL) 14 January 1997 see column 3, line 12 - column 5, line 29 see column 7, line 25 - line 35 --- -/--	1,4,5,8

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

15 April 1999

Date of mailing of the international search report

26/04/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Gerling, J.C.J.

This Page Blank (uspto)

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 98/03881

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>US 5 579 318 A (WATSON PAUL T ET AL) 26 November 1996 see column 3, line 46 - column 4, line 65 see column 5, line 55 - column 7, line 67 see column 9, line 64 - column 11, line 16 ---</p>	1,4,5,8
A	<p>EP 0 702 496 A (AT & T CORP) 20 March 1996 -----</p>	

This Page Blank (uspto)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 98/03881

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9714237 A	17-04-1997	SE 507482 C AU 7351096 A CN 1202998 A EP 0855113 A SE 9503486 A	15-06-1998 30-04-1997 23-12-1998 29-07-1998 10-04-1997
US 5594942 A	14-01-1997	SE 501088 C AU 673595 B AU 6439294 A CN 1106986 A EP 0683942 A FI 945627 A JP 7507912 T SE 9301076 A WO 9423506 A	07-11-1994 14-11-1996 24-10-1994 16-08-1995 29-11-1995 29-11-1994 31-08-1995 01-10-1994 13-10-1994
US 5579318 A	26-11-1996	NONE	
EP 0702496 A	20-03-1996	CA 2154803 A CN 1124000 A JP 8107449 A SG 33486 A	14-03-1996 05-06-1996 23-04-1996 18-10-1996

This Page Blank (uspto)

REC'D 10 MAR 2000

WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference TRC/BP5744354	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB98/03881	International filing date (day/month/year) 22/12/1998	Priority date (day/month/year) 30/12/1997
International Patent Classification (IPC) or national classification and IPC H04Q7/34		
Applicant ORANGE PERSONAL COMMUNICATIONS SERVICES.. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

- ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 24/06/1999	Date of completion of this report 08.03.2000
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Schweitzer, J-C Telephone No. +49 89 2399 8963 

This Page Blank (uspto)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB98/03881

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-19 as originally filed

Claims, No.:

1-8 as originally filed

Drawings, sheets:

1/2-2/2 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

This Page Blank (uspto)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB98/03881

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1 - 8
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1 - 8
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1 - 8
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

This Page Blank (uspto)

Concerning section V.2 (reasoned statement under Article 35(2) PCT)

Claim 1 relates to a telecommunications (e.g. mobile) network having a least a database of functions for controlling the network, said database comprising at least a data function and a data control function. According to the invention, the database is replicated in a plurality of databases. In order to synchronise updating of the databases, one database is identified as a primary database, at least one is identified as a primary standby database, and the others are identified as secondary databases. In normal operation, the data control function of the primary database is arranged to generate signals for synchronised updating of the other databases. In the event of a failure of the primary database, the standby primary database takes over the updating operating.

Such a network arrangement using a "primary standby database" for failure recovery and synchronising purposes, as claimed, is neither taught, nor rendered obvious, alone or in combination, by the prior art documents acknowledged in the description or cited in the International Search Report which generally deal with standby databases.

Claim 1 is therefore novel and considered to involve the required inventive step, Articles 33(2) and (3) PCT. The subject-matter of claim 1 is also industrially applicable.

The same applies to independent **claim 5**, which corresponds essentially to claim 1, and to the corresponding independent method **claims 4 and 8**, which are all based on the same novel and inventive concept. Claims 4, 5 and 8, therefore, equally meet all the requirements of Article 33 PCT.

Dependent claims 2, 3, 6 and 7 relate to further implementing details of the networks or methods defined by the independent claims to which they refer and are thus equally novel, inventive and industrially applicable.

Concerning section VII (form and contents).

In order to meet the requirements of Rule 5.1.(a),(ii) PCT, at least one of the prior art documents cited in the search report, e.g. **US-A-5 559 818** or **EP-A-0 702 496**, should have been acknowledged by reference and briefly discussed in the introductory part of the description.

This Page Blank (uspto)

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/GB98/03881

The claims do not include reference signs in parentheses where features shown in the drawings are referred to, contrary to Rule 6.2.(b) PCT.

On page 2, line 12, the "incorporated by reference" statement should have been deleted, since the application should be self-contained and this document clearly does not contain matter regarding essential features of the invention (see PCT-Guidelines for Preliminary Examination, PG-II, 4.17).

The application does not meet the requirements of conciseness (Article 6 PCT). In the present case it is considered appropriate to use only one independent claim in any category as there is actually only one embodiment of the invention described.

This Page Blank (uspto)

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB98/03881

i. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-19 as originally filed

Claims, No.:

1-8 as originally filed

Drawings, sheets:

1/2-2/2 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

This Page Blank (uspto)

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/GB98/03881

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1 - 8
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1 - 8
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1 - 8
	No:	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

This Page Blank (uspto)

Concerning section V.2 (reasoned statement under Article 35(2) PCT)

Claim 1 relates to a telecommunications (e.g. mobile) network having at least a database of functions for controlling the network, said database comprising at least a data function and a data control function. According to the invention, the database is replicated in a plurality of databases. In order to synchronise updating of the databases, one database is identified as a primary database, at least one is identified as a primary standby database, and the others are identified as secondary databases. In normal operation, the data control function of the primary database is arranged to generate signals for synchronised updating of the other databases. In the event of a failure of the primary database, the standby primary database takes over the updating operating.

Such a network arrangement using a "primary standby database" for failure recovery and synchronising purposes, as claimed, is neither taught, nor rendered obvious, alone or in combination, by the prior art documents acknowledged in the description or cited in the International Search Report which generally deal with standby databases.

Claim 1 is therefore novel and considered to involve the required inventive step, Articles 33(2) and (3) PCT. The subject-matter of claim 1 is also industrially applicable.

The same applies to independent **claim 5**, which corresponds essentially to claim 1, and to the corresponding independent method **claims 4 and 8**, which are all based on the same novel and inventive concept. Claims 4, 5 and 8, therefore, equally meet all the requirements of Article 33 PCT.

Dependent claims 2, 3, 6 and 7 relate to further implementing details of the networks or methods defined by the independent claims to which they refer and are thus equally novel, inventive and industrially applicable.

Concerning section VII (form and contents).

In order to meet the requirements of Rule 5.1.(a),(ii) PCT, at least one of the prior art documents cited in the search report, e.g. **US-A-5 559 818** or **EP-A-0 702 496**, should have been acknowledged by reference and briefly discussed in the introductory part of the description.

This Page Blank (uspto)

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No.: ~~PCT~~/GB98/03881

The claims do not include reference signs in parentheses where features shown in the drawings are referred to, contrary to Rule 6.2.(b) PCT.

On page 2, line 12, the "incorporated by reference" statement should have been deleted, since the application should be self-contained and this document clearly does not contain matter regarding essential features of the invention (see PCT-Guidelines for Preliminary Examination, PG-II, 4.17).

The application does not meet the requirements of conciseness (Article 6 PCT). In the present case it is considered appropriate to use only one independent claim in any category as there is actually only one embodiment of the invention described.

This Page Blank (uspto)